Journal of Food Protection, Vol. 63, No. 6, 2000, Pages 807–809

Incidence of Foodborne Illnesses Reported by the Foodborne Diseases Active Surveillance Network (FoodNet)—1997

DAVID J. WALLACE,[1]* THOMAS VAN GILDER,[1] SUE SHALLOW,[2] TERRY FIORENTINO,[3] SUZANNE D. SEGLER,[4] KIRK E. SMITH,[5] BELETSHACHEW SHIFERAW,[6] RUTH ETZEL,[7] WALLACE E. GARTHRIGHT,[8] FREDERICK J. ANGULO,[9] AND FOODNET WORKING GROUP[9]

[1]*Centers for Disease Control and Prevention, Division of Bacterial and Mycotic Diseases, National Center for Infectious Disease, Foodborne and Diarrheal Diseases Branch, 1600 Clifton Road N.E., Atlanta, Georgia 30333;*
[2]*California Emerging Infections Program—San Francisco Office, 703 Market Street, Suite 705, San Francisco, California 94103;*
[3]*Connecticut Emerging Infections Program, Yale University School of Public Health, 40 Temple Street, Suite 1B, New Haven, Connecticut 06510;*
[4]*Georgia Emerging Infections Program, Atlanta VA Medical Center, Research 151 Room 5A-185, 1670 Clairmont Road, Decatur, Georgia 30033;*
[5]*Minnesota Department of Health, Acute Disease Epidemiology, 717 Delaware Street S.E., Minneapolis, Minnesota 55414;*
[6]*Oregon Health Division, 800 Northeast Oregon Street, Suite 772, Portland, Oregon 97232;*
[7]*U.S. Department of Agriculture, Food Safety and Inspection Service, Epidemiology and Risk Assessment Division, Room 3715 Franklin Court, 1400 Independence Avenue S.W., Washington, D.C. 20250-3700;* [8]*Food and Drug Administration, Center for Food Safety and Applied Nutrition, 200 C Street S.W., Washington, D.C. 20204; and* [9]*Centers for Disease Control and Prevention, Division of Bacterial and Mycotic Diseases, National Center for Infectious Disease, Foodborne and Diarrheal Diseases Branch, 1600 Clifton Road N.E., Atlanta, Georgia 30333, USA*

MS 99-500: Received 3 September 1999/Accepted 4 February 2000

ABSTRACT

In 1997, the Foodborne Diseases Active Surveillance Program (FoodNet) conducted active surveillance for culture-confirmed cases of *Campylobacter, Escherichia coli* O157, *Listeria, Salmonella, Shigella, Vibrio, Yersinia, Cyclospora,* and *Cryptosporidium* in five Emerging Infections Program sites. FoodNet is a collaborative effort of the Centers for Disease Control and Prevention's National Center for Infectious Diseases, the United States Department of Agriculture's Food Safety and Inspection Service, the Food and Drug Administration's Center for Food Safety and Applied Nutrition, and state health departments in California, Connecticut, Georgia, Minnesota, and Oregon. The population under active surveillance for foodborne infections was approximately 16.1 million persons or roughly 6% of the United States Population. Through weekly or monthly contact with all clinical laboratories in these sites, 8,576 total isolations were recorded: 2,205 cases of salmonellosis, 1,273 cases of shigellosis, 468 cases of cryptosporidiosis, 340 of *E. coli* O157:H7 infections, 139 of yersiniosis, 77 of listeriosis, 51 of *Vibrio* infections, and 49 of cyclosporiasis. Results from 1997 demonstrate that while there are regional and seasonal differences in reported incidence rates of certain bacterial and parasitic diseases, and that some pathogens showed a change in incidence from 1996, the overall incidence of illness caused by pathogens under surveillance was stable. More data over more years are needed to assess if observed variations in incidence reflect yearly fluctuations or true changes in the burden of foodborne illness.

Each year, millions of persons become ill from foodborne diseases, though many cases are not reported. The Foodborne Diseases Active Surveillance Network (FoodNet), the primary foodborne diseases component of Centers for Disease Control and Prevention's Emerging Infections Program *(2)* was developed to characterize better, understand more completely, and respond more rapidly to foodborne illness in the United States. This report describes the FoodNet surveillance data from 1997, the second year of surveillance, and compares findings with data from 1996. These findings demonstrate regional and seasonal differences in the reported incidence rates of certain bacterial and parasitic diseases and that substantial changes occurred in the incidence rates of illnesses caused by some pathogens (e.g., *Vibrio* and *Escherichia coli* O157:H7), but the overall incidence of illness caused by the seven diseases under surveillance in both years changed little.

* Author for correspondence. Tel: 404-371-5408; Fax: 404-371-5444; E-mail: dow4@cdc.gov.

METHODS

Active surveillance for laboratory-confirmed cases of *Campylobacter, E. coli* O157:H7, *Listeria, Salmonella, Shigella, Vibrio,* and *Yersinia* infections was initiated on 1 January 1996, in Minnesota, Oregon, two counties in California, two counties in Connecticut (expanding to three in 1997), and eight counties in Georgia (expanding to 20 counties in 1997). In 1997, surveillance for laboratory-confirmed cases of *Cryptosporidium* and *Cyclospora* infections was added statewide in Minnesota, Oregon, Connecticut, and eight counties (including the two counties with bacterial surveillance) in California. To identify cases, surveillance personnel contacted each clinical laboratory in their catchment areas either weekly or monthly, depending on the size of the clinical laboratory. Annual incidence was calculated using the number of reported cases as the numerator and 1997 postcensus estimates as the denominator *(1)*. Monthly incidence was calculated based on date of specimen collection.

RESULTS

1997 surveillance. In 1997, 8,576 laboratory-confirmed cases were identified: 3,974 of campylobacteriosis,

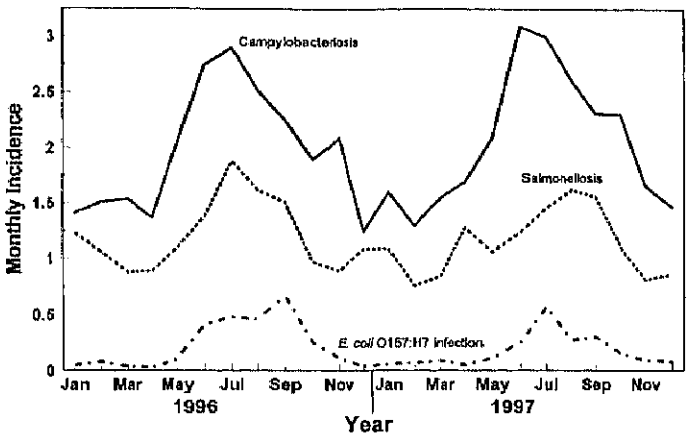

FIGURE 1. *Monthly incidence (per 100,000 population) of selected diseases—FoodNet, 1996 to 1997.*

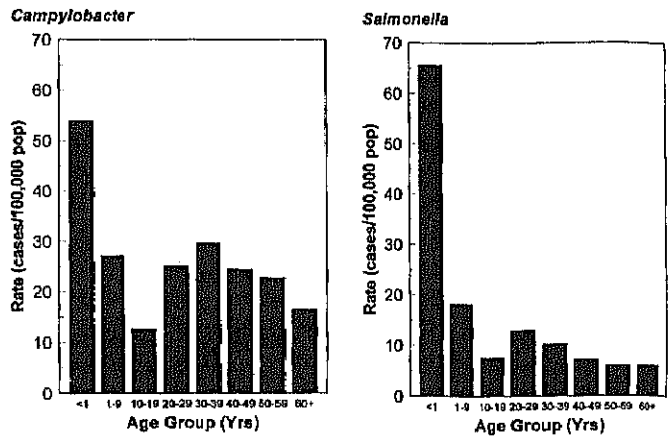

FIGURE 2. *Incidence (per 100,000 population) of laboratory-confirmed cases of* Campylobacter *and* Salmonella *infections by age group—FoodNet, 1997.*

2,205 of salmonellosis, 1,273 of shigellosis, 468 of cryptosporidiosis, 340 of *E. coli* O157:H7 infections, 139 of yersiniosis, 77 of listeriosis, 51 of *Vibrio* infections, and 49 of cyclosporiasis. Seasonal variation in isolation rates was seen for several pathogens; 52% of *E. coli* O157:H7, 35% of *Campylobacter,* and 32% of *Salmonella* were isolated in summer months (June through August) (Fig. 1). Organisms were isolated from normally sterile sites, including blood and cerebrospinal fluid, in 99% of reported *Listeria* cases, 7% of *Salmonella,* 3% of *Yersinia,* and <1% of *Shigella* and *Campylobacter.* Overall, 1,270 (15%) of 8,576 patients with laboratory-confirmed infections were hospitalized; hospitalization rates by illness were highest for listeriosis (88%), *E. coli* O157:H7 infections (29%), and salmonellosis (21%). Thirty-six patients with laboratory-confirmed infections died: 15 with *Listeria,* 13 with *Salmonella,* 4 with *E. coli* O157:H7, 2 with *Cryptosporidium,* 1 with *Campylobacter,* and 1 with *Shigella.*

All-site incidence was highest for campylobacteriosis (24.7 per 100,000 population), salmonellosis (13.7 per 100,000), and shigellosis (7.8 per 100,000). The incidence of campylobacteriosis varied from 49.3 per 100,000 in California to 13.7 per 100,000 in Georgia. Although overall salmonellosis incidence was similar among the sites, the incidence of infections with *Salmonella* serotype Enteritidis varied, from 5.8 per 100,000 in Connecticut to 0.6 per 100,000 in Georgia. Shigellosis incidence varied from 16.2 per 100,000 in Georgia to 2.9 per 100,000 in Minnesota. Incidence differed by site for *E. coli* O157:H7 infections and yersiniosis: *E. coli* O157:H7 infections varied from 4.2 per 100,000 in Minnesota to 0.2 per 100,000 in Georgia; yersiniosis varied from 1.2 per 100,000 in Georgia to 0.5 per 100,000 in Oregon.

Annual incidence also varied by age; for example, the campylobacteriosis incidence among children aged <1 year was 56 per 100,000 (range: 18 per 100,000 in Georgia to 159 per 100,000 in California) compared to 14 per 100,000 (range: 8 per 100,000 for Georgia to 33 per 100,000 in California) for persons 10 to 19 years and for salmonellosis was 111 per 100,000 (range: 66 per 100,000 in Oregon to 174 per 100,000 in California) among children aged <1 year compared to 9 per 100,000 (range: 6 per 100,000 in Oregon to 13 per 100,000 in Connecticut) for persons 60 years and older (Fig. 2).

Comparison with 1996 surveillance data. Overall, incidence of illness caused by the pathogens under surveillance changed little from 1996 to 1997 (Table 1). The largest percentage change occurred in cases of illness caused by *Vibrio* (from 0.1 case per 100,000 in 1996 to 0.3 in 1997). *E. coli* O157:H7 showed the next largest percentage change (2.7 cases per 100,000 in 1996, 2.1 per 100,000 in 1997, a decrease of 22%). From 1996 to 1997, Minnesota and Oregon reported an overall increase in the incidence of illnesses caused by the pathogens under surveillance; California, Connecticut, and Georgia reported overall decreases.

DISCUSSION

The findings from FoodNet in 1997 document regional and seasonal differences in the incidence rates of bacterial foodborne diseases. Although the pathogens under surveillance can be transmitted in a variety of ways (e.g., through

TABLE 1. *Incidence[a] of selected laboratory-confirmed pathogens, by year—FoodNet, 1996–1997*

	All sites	
Organism	96	97
Campylobacter	23.5	24.7
Escherichia coli O157	2.7	2.1
Listeria	0.5	0.5
Salmonella	14.5	13.7
Shigella	8.9	7.9
Vibrio	0.1	0.3
Yersinia	1.0	0.9
Cryptosporidium	—[b]	2.8
Cyclospora	—[b]	0.3
Total	51.2	50.1[c]

[a] Per 100,000 population.
[b] Not reported in 1996.
[c] Excludes *Cryptosporidium* and *Cyclospora.*

water and person-to-person), they are often transmitted by food.

Differences in levels of contamination of specific food items and differences in food-handling practices might explain some of the variation. The variation in the regional incidence rates for *Campylobacter* and *Salmonella* is unlikely to be a result of different culturing practices because the proportion of specimens tested for these pathogens remained consistently high across the sites (>99%). The possible role of differences in culturing practices in the regional variation for other pathogens is under active investigation.

More data over more years are needed to assess whether the variations in rates for specific pathogens reflect year-to-year variation, or are part of longer-term trends. For *Vibrio,* the dramatic increase in incidence is the result of a large outbreak during the summer of 1997 of *Vibrio parahaemolyticus* infections linked to raw oyster consumption in the Pacific Northwest *(3).* The decrease in incidence of *E. coli* O157:H7 infections in 1997 is linked to fewer cases associated with known outbreaks in FoodNet catchment areas. Important changes in the pathogens under surveillance (e.g., the development of fluoroquinolone resistance in *Campylobacter (5)*) are not reflected in annual incidence data. Additional investigations—including laboratory, physician, and population surveys, and pathogen-specific case-control studies *(4)*—are underway to elucidate further the differences in annual incidence.

FoodNet was initiated in 1995 as a collaborative effort of the Centers for Disease Control and Prevention, the U.S. Department of Agriculture, the U.S. Food and Drug Administration, and the California, Connecticut, Georgia, Minnesota, and Oregon state health departments. In 1997, the catchment area included 16.1 million persons, 6.0% of the U.S. population. Two new sites (selected counties in Maryland and in New York) joined FoodNet in 1997; data from these sites will be included in the subsequent FoodNet surveillance reports. An eighth site will be added in 1999. Continued monitoring of the incidence of foodborne illness and analysis of data from FoodNet studies will allow a more accurate description and a better understanding of foodborne illness in this country. Additional information about FoodNet, including the 1997 summary report, can be found on the World Wide Web at http://www.cdc.gov/ncidod/dbmd/foodnet/foodnet.htm.

REFERENCES

1. Bureau of the Census, Economics and Statistics Administration, U.S. Department of Commerce Population Estimates (Internet, WWW). Address: http://www.census.gov/population/www/estimates/popest.html.
2. Centers for Disease Control and Prevention. 1997. The Foodborne Diseases Active Surveillance Network, 1996. Morbid. Mortal. Weekly Rep. 46:258–261.
3. Centers for Disease Control and Prevention. 1998. Outbreak of *Vibrio parahaemolyticus* infections associated with eating raw oysters—Pacific Northwest, 1997. Morbid. Mortal. Weekly Rep. 47:457–462.
4. Kassenborg, H., C. Hedberg, M. Evans, G. Chin, T. Fiorentino, D. Vugia, M. Bardsley, L. Slutsker, and P. Griffin. 1998. Case-control study of sporadic *Escherichia coli* O157:H7 infections in 5 FoodNet sites (CA, CT, GA, MN, OR), p. 50. Abstr. International Conference on Emerging Infectious Diseases, Atlanta, Ga., 8–11 March 1998. American Society of Microbiology, Washington, D.C.
5. Smith, K. E., J. Besser, P. Leano, J. Bender, J. Wicklund, B. Johnson, C. Hedberg, K. Vought, K. MacDonald, and M. Osterholm. 1999. Fluoroquinolone-resistant *Campylobacter* isolated from humans and poultry in Minnesota. N. Engl. J. Med. 340:1525–1532.